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1975

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Recommended Citation

Wahlstrom, Richard W.; Libal, George W.; and Vogel, Alan, "Effect of Calcium and Phosphorus Sources and Levels in Growing-Finishing Swine Diets" (1975). *South Dakota Swine Field Day Proceedings and Research Reports, 1975*. Paper 6.

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A.S. Series 75-53

Effect of Calcium and Phosphorus Sources and Levels
in Growing-Finishing Swine Diets

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Animal by-products from the slaughter house industry contain high levels of calcium and phosphorus and may be used to supply part of these elements in swine diets during times of a shortage of supply of the mineral supplements. Since animal by-products are also high in protein, the amount of soybean meal can be reduced when they are included in the diet.

A shortage of phosphorus supplements existed in early 1974 and this experiment was conducted to study the effect of supplying all of the supplementary phosphorus in the diet with the use of meat and bone meal containing 4% phosphorus, 8% calcium and 50% protein. Calcium and phosphorus levels were also evaluated using ratios of calcium to phosphorus of 1.2:1, 1:1 and 1:1.25.

Experimental Procedure

Seventy-two pigs were allotted to three replications of four treatments. Each of the four lots consisted of three barrows and three gilts. The pigs were housed in a total confinement building in pens 5 feet by 16 feet in which self-feeders and automatic waterers were located. Average initial weight was about 44 pounds.

The composition of the basal diet is shown in table 1. All diets contained the same levels of phosphorus but varied in calcium level or source of calcium. The dietary treatments were as follows:

1. Corn-soy control, calcium:phosphorus ratio 1.2:1
2. Corn-soy-meat and bone meal, calcium:phosphorus ratio 1.2:1
3. Corn-soy diet, calcium:phosphorus ratio 1:1
4. Corn-soy diet, calcium:phosphorus ratio 1:1.25

The pigs were removed by lots when they weighed approximately 210 lb. except for those on treatment 2 that weighed about 200 lb. when removed because of a need for the pens.

Results

Table 2 summarizes the results of average daily gain, feed consumption and feed/gain for the growing, finishing and overall periods of this experiment.

Average daily gain was similar for all three treatments that received the corn-soybean meal diets. Calcium to phosphorus ratios from 1.2:1 to 1:1.25 did not affect pig performance. Phosphorus levels were constant at 0.55% in

grower diets and 0.5% in finisher diets. Calcium ranged from 0.66% in treatment 1 to 0.44% in treatment 4 during the growing phase and from 0.6 to 0.4% in the finishing phase. The low level of calcium is lower than recommended, but it did not affect growth performance in this trial.

Pigs fed the diet containing meat and bone meal to equal all of the phosphorus supplied by dicalcium phosphate in the other treatments gained more slowly throughout the trial. However, only the overall gain of 1.51 lb. per day for this group was significantly less than the gain of 1.65 lb. per day for pigs fed diet 1 which had identical levels of calcium and phosphorus as the meat and bone meal diet. It is possible that the level of meat and bone meal used created a deficiency of some amino acid or it may have decreased palatability as less feed was consumed by these pigs while their feed/gain was similar to that for other treatment groups.

Summary

An experiment was conducted using 72 weanling pigs fed corn-soybean meal diets calculated to be equal in phosphorus but with different calcium levels or using meat and bone meal as a phosphorus source.

In this experiment, faster gains were obtained with corn-soybean meal diets supplemented with phosphorus from dicalcium phosphate than when meat and bone meal was fed as the phosphorus source. Calcium levels from 0.66 to 0.44% in grower diets and from 0.6 to 0.4% in finishing pig diets did not affect growth performance of pigs fed diets containing 0.55 or 0.5% of phosphorus during the growing and finishing periods, respectively.

Table 1. Composition of Diets (Percent)

Ingredients	To 120 lb.				120 to 210 lb.			
	1A	2A	3A	4A	1B	2B	3B	4B
Corn	78.3	81.4	78.6	78.85	87.4	90.3	87.7	87.95
SBM, 44%	19.0	11.4	19.0	19.0	10.0	3.2	10.0	10.0
Meat and bone meal	--	6.2	--	--	--	5.6	--	--
Dicalcium	1.2	--	1.2	1.2	1.1	--	1.1	1.1
Limestone	0.8	0.3	0.5	0.25	0.8	0.3	0.5	0.25
Trace mineral salt ^a	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Premix ^b	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Calculated content, %								
Protein	15.4	15.4	15.4	15.4	12.3	12.3	12.3	12.3
Calcium	0.66	0.66	0.55	0.44	0.6	0.6	0.5	0.4
Phosphorus	0.55	0.55	0.55	0.55	0.5	0.5	0.5	0.5

^aContained 0.8% zinc.

^bSupplied per lb. of diet: vitamin A, 1500 IU; vitamin D, 150 IU; riboflavin, 1.25 mg; pantothenic acid, 5 mg; niacin, 10 mg; choline, 50 mg; vitamin B₁₂, 7.5 mcg and tyran, 8 milligrams.

Table 2. Results of Feeding Different Calcium and Phosphorus Sources and Levels in Swine Diets

	Treatments			
	1	2	3	4
Number of pigs ^a	18	18	18	18
Avg. initial wt., lb.	44.5	44.0	44.9	44.6
Avg. final wt., lb.	214.5	198.8	209.9	211.1
<u>Initial to 120 lb.</u>				
Avg. daily gain, lb.	1.60	1.48	1.59	1.60
Avg. feed consumed, lb.	4.19	4.05	4.15	4.21
Feed/gain	2.63	2.73	2.63	2.60
<u>120 lb. to 210 lb.</u>				
Avg. daily gain, lb.	1.73	1.55	1.64	1.65
Avg. feed consumed, lb.	5.93	5.83	6.31	6.00
Feed/gain	3.50	3.53	3.85	3.48
<u>Initial to 210 lb.</u>				
Avg. daily gain, lb.	1.65 ^b	1.51	1.61	1.63
Avg. feed consumed, lb.	5.01	4.89	5.13	5.06
Feed/gain	3.06	3.13	3.12	3.09

^aThree replicates of 6 pigs each per treatment.

^bSignificantly greater than treatment 2 ($P < .05$).